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Implicit Theories About Willpower Predict Subjective Well-Being

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Abstract

Objective: Lay theories about willpower—the belief that willpower is a limited versus nonlimited resource—affect self-control and goal striving in everyday life (Job, Dweck, & Walton, 2010). Three studies examined whether willpower theories relate to people's subjective well-being by shaping the progress they make towards their personal goals.

Method: A cross-sectional (Study 1) and two longitudinal studies (Study 2 & 3) measured individuals' willpower theories and different indicators of subjective well-being. Additionally, Study 3 measured goal striving and personal goal progress.

Results: A limited theory about willpower was associated with lower subjective well-being in a sample of working adults (Study 1, $N = 258$). Further, a limited theory predicted lower levels of well-being at a time when students faced high self-regulatory demands (Study 2, $N = 196$). Study 3 ($N = 157$) replicated the finding that students with a limited theory experienced lower well-being in phases of high demands and found that personal goal progress mediated this relationship.

Conclusions: The belief that willpower is based on a limited resource has negative implications not only for self-control but also for personal goal-striving and subjective well-being.

Keywords: implicit theories about willpower, well-being, self-regulation, personal goals

Implicit Theories About Willpower Predict Subjective Well-Being

Recent research suggests that self-control depends on people's beliefs—or implicit theories—about willpower (Job et al., 2010). Some people believe that their willpower resembles a limited resource that gets easily depleted (*limited theory*), whereas others believe that their willpower is nonlimited and can be activated by exerting self-control (*nonlimited theory*). Endorsing a nonlimited theory has been found to be beneficial for self-control in everyday life, thereby also affecting students' academic performance (Job et al., 2010; Job, Walton, Bernecker, & Dweck, 2015). Another line of research has demonstrated that self-control is positively associated with people's subjective well-being (de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2013; Moffitt et al., 2011). For instance, people with high trait self-control tend to experience higher subjective well-being and psychological adjustment (Hofmann et al., 2013; Tangney, Baumeister, & Boone, 2004).

In the present paper, we propose that endorsing a nonlimited theory about willpower is related to higher subjective well-being. Viewing willpower as a nonlimited resource should help people to successfully strive for their personal goals, particularly as self-regulatory demands increase, and, thereby, promote progress towards these goals. Personal goal progress, in turn, is an important predictor for subjective well-being (Brunstein, 1993; Diener, Suh, Lucas, & Smith, 1999).

Implicit Theories About Willpower and Self-Control

The concept of implicit theories—the beliefs people hold about personal attributes—and their effects on academic and psychological functioning have a long tradition in the developmental, educational, and social psychological literature (e.g., Dweck & Leggett, 1988;

Molden & Dweck, 2006). Implicit theories capture peoples beliefs about whether self-attributes such as intelligence and personality can change—some people believe these attributes are fixed (entity theory), whereas others believe these attributes change with effort and learning (incremental theory). The term "implicit theory" thereby does not refer to the method of measurement but to the fact that people are usually not aware of their lay beliefs and the effects these beliefs may have on their behavior. There is converging evidence that endorsing an incremental theory promotes academic performance and psychological functioning during challenging conditions, such as in difficult educational transitions (Blackwell, Trzesniewski, & Dweck, 2007; Dweck, Chiu, & Hong, 1995; Schroder, Dawood, Yalch, Donnellan, & Moser, 2014; Yeager et al., 2014).

Recently, the concept of implicit theories was adapted to the field of self-control. Job, Dweck, and Walton (2010) proposed that people hold different theories about their willpower and showed that these theories matter for self-control performance in the lab and in everyday life. In their studies, implicit theories about willpower were measured by asking people how much they agree with items such as "After a strenuous mental activity, your energy is depleted and you must rest to get it refueled again" (reflecting a limited theory) or "After a strenuous mental activity, you feel energized for further challenging activities" (reflecting a nonlimited theory). In three experiments, Job and colleagues (2010) found that willpower theories moderate the so called *ego-depletion effect*, which describes the finding that self-control usually relapses on the second of two subsequent self-control tasks (Hagger, Wood, Stiff, & Chatzisarantis, 2010; but see Carter & McCullough, 1998). Only people who endorsed a limited theory about willpower showed declines in self-control performance after an initial act of self-control. Individuals who endorsed a nonlimited theory maintained their self-control performance in spite

of previous self-control exertion. Importantly, this pattern of results replicated when willpower theories were manipulated and not measured suggesting their causal role (Job et al., 2010; Miller et al., 2012; for similar findings see Salmon, Adriaanse, De Vet, Fennis, & De Ridder, 2014).

Apart from this experimental evidence, field studies suggest that willpower theories are also relevant for self-regulation in everyday life, particularly in times when people face high self-regulatory demands (Job et al., 2010, 2015). In one study, students were surveyed three times over the course of one academic quarter, once at the beginning, the middle, and the end (Job et al., 2010, Study 4). The rational for this design was that the commencement of exams increases self-regulatory demands. Students have to study more, which means they have to engage in more strenuous mental activity and resist the temptation to engage in other more fun activities. As expected, students who endorsed a limited theory reported more self-control failure at the end of the academic quarter. They procrastinated more and consumed more high-caloric foods compared to students with a nonlimited theory. Most pertinent to the present research, students with a limited theory also reported lower self-regulation with respect to a challenging personal goal. For example, they reported that they were often not in the mood to pursue the goal or that they got easily distracted from doing something for their goal (Job et al., 2010, Study 4).

Recently, these findings were replicated in another sample of students who were surveyed in the weeks prior to their final exams (Job et al., 2015). In this study, self-regulatory demands were measured via self-report (e.g., number of tests, conflicts with close others, health problems) and with an objective measure (i.e., students' course load extracted from their official academic records). Again, among students with high self-regulatory demands those endorsing a limited theory reported lower self-regulation than those endorsing a nonlimited theory. Further, students endorsing a limited theory earned a lower grade point average (controlling for their previous

grade point average), particularly when they had a high course load. The effect of willpower theories on grades was mediated by differences in procrastination prior to the exams (Job et al., 2015). Students with a limited theory procrastinated more, which was in turn related to a lower grade point average. Taken together, the findings suggest that endorsing a limited theory undermines self-regulation in everyday life, particularly when people face high self-regulatory demands. Further, by affecting everyday self-regulation, willpower theories affect important achievement-related outcomes.

Building upon these findings, the present study aimed to examine the relationship between willpower theories and subjective well-being. We predicted that people with a limited theory experience lower subjective well-being than people with a nonlimited theory, particularly when they face high self-regulatory demands. Based on previous findings about a link between a limited theory and self-regulation on a challenging personal goal, we assumed that goal progress would mediate the effect of willpower theories on well-being.

Goal Progress and Subjective Well-Being

Within the past decades, research on subjective well-being has shown that having goals and making progress toward them contributes to high subjective well-being (Diener et al., 1999). Personal goals embrace individual meaning and describe what a person is striving for in his or her current life situation and what he or she wants to attain or avoid in the future (Brunstein & Maier, 2002). Past findings suggest that goal progress predicts higher levels of life satisfaction and affective well-being (Brunstein, 1993; Emmons, 1986; Sheldon & Elliot, 1999). For instance, one longitudinal study found that students' progress toward personal goals within one term predicted higher life satisfaction and affective well-being at the end of the term (Brunstein, 1993). Similarly, findings from a diary study suggest that progress on work-related goals

increases positive affect over the course of a workday (Harris, Daniels, & Briner, 2003). A recent meta-analysis of 85 studies found a significant association between goal progress and subjective well-being (ρ = .43, 95% CI [.39, .47]; Klug & Maier, 2014).

In the present research, we link research on personal goals and subjective well-being with previously reported findings that suggest beneficial effects of a nonlimited theory about willpower on personal goal-striving, particularly in times of high self-regulatory demands (Job et al., 2010, 2015). We hypothesize that implicit theories about willpower are related to subjective well-being, because they affect people's goal-related self-regulation and the progress they make towards personal goals. We assume that people with a limited theory are less able to effectively strive for their personal goals, particularly when self-regulatory demands are high, and therefore make less progress on their personal goals in the long run, which in turn undermines their well-being.

Overview

Based on the literature summarized above, we expected a limited theory about willpower to be associated with lower levels of subjective well-being. In line with previous research showing that willpower theories predict differences in self-regulation when self-regulatory demands are high, we expected that the relationship between willpower theories and subjective well-being is particularly strong at times when people face high self-regulatory demands (i.e., final exam period). Thus, willpower theories should predict *change* in subjective well-being over a period of time in which self-regulatory demands increase (i.e., over the course of a term). As demands increase, a limited theory should predict a negative trend in well-being while well-being remains on a higher level for people with a nonlimited theory. Further, we

tested whether over a period of increasing self-regulatory demands change in personal goal progress mediates the link between willpower theories and change in well-being.

The hypotheses were examined in three studies. Study 1 establishes the relationship between implicit theories about willpower and subjective well-being in a group of working adults using a cross-sectional design. Study 2 examines whether implicit theories about willpower predict changes in subjective well-being as demands increase over the course of the term in a sample of students. Finally, Study 3 tests whether goal progress mediates the relationship between willpower theories and subjective well-being using a daily diary design.

Study 1

The purpose of Study 1 was to test the hypothesis that a nonlimited theory is associated with higher levels of well-being, indicated by higher life satisfaction and affective well-being in a sample of working adults.

Method

Participants. The study was posted on different Swiss and German internet forums on stress and burnout.[1] Overall, 427 working adults followed the link and signed the informed consent for the study. Of those $n = 258$ (163 women, 95 men, $M_{age} = 39.2$ years, $range_{age} = 18\text{-}65$ years) completed all measures of interest and were included in the final analyses. The sample was diverse regarding employment and family status (148 worked fulltime, 56 worked part time, 36 were self-employed, six were students, four were retired workers, and eight indicated "other" without further specification, 110 indicated having at least one child). Participants received a coupon for a popular online retailer worth 20 Swiss Francs ($22 USD) for filling in the 60-minute survey.

Measures and Procedure

Implicit theories about willpower. Implicit theories about willpower were assessed with a 6-item scale (Job et al., 2010). Three items reflected a limited theory (e.g., "After a strenuous mental activity your energy is depleted and you must rest to get it refueled again"), and three items a nonlimited theory (e.g. "Your mental stamina fuels itself; even after strenuous mental exertion you can continue doing more of it"). Participants indicated how much they agreed with these items on a 6-point scale (1 = *Strongly disagree*; 6 = *Strongly agree*). Items reflecting a nonlimited theory were recoded before all items were averaged to one measure of implicit theory about willpower ($\alpha = .83$). Higher scores on the scale reflect higher agreement with a limited theory.

Life satisfaction. The German version of the satisfaction with life scale was administered to measure life satisfaction (Diener, Emmons, Larsen, & Griffin, 1985; Glaesmer, Grande, Braehler, & Roth, 2011). Participants judged their current satisfaction with life on five items (e.g., "In most ways my life is close to my ideal") using a 7-point scale (1 = *Do not agree at all*; 7 = *Perfectly agree*). The items were averaged to one index with high scores representing high life satisfaction ($\alpha = .91$).

Affective well-being. The multidimensional mood questionnaire assessed participants' affective well-being (Steyer, Schwenkmezger, Notz, & Eid, 1997). The scale measures mood on three dimensions, namely pleasantness (pleasant versus unpleasant), alertness (awake versus tired), and serenity (calm versus stressed) with 16 items, eight for the dimension pleasantness (e.g., "happy", "dissatisfied" [recoded], $\alpha = .96$), four for the dimension alertness (e.g., "awake", "tired" [recoded], $\alpha = .88$), and four for the dimension serenity (e.g., "calm", "restless [recoded], $\alpha s = .86$). Participants indicated how they recently felt on a 5-point scale (1 = *Not at all*; 5 = *Very*

much). The items of each dimension were averaged with higher scores reflecting positive mood states (i.e., pleasant, awake, calm).

Results

To test the relationship between implicit theories about willpower and subjective well-being, we calculated bivariate zero-order correlations. As depicted in Table 1, implicit theories about willpower were significantly correlated with life satisfaction and all three mood dimensions. The more participants endorsed a limited theory, the lower was their life satisfaction and the more often they experienced unpleasant mood states. According to convention, the effects were of moderate size (Cohen, 1988).

To test whether willpower theories affected life satisfaction independent of their effect on affective well-being, we calculated partial correlations. The correlations between implicit theories about willpower and life satisfaction was still significant when all three dimensions of affective well-being were controlled, $r(253) = -.21$, $p < .001$. This suggests that willpower theories are related to life satisfaction and affective well-being independently.

Discussion

This first study provides initial evidence for the hypothesis that endorsing a limited theory is associated with lower levels of subjective well-being. Because the sample was recruited on an online forum on stress and burnout, the sample was probably selective in terms of high objective demands or perceived stress. While the selection in terms of high demands was beneficial to test our theoretical argument, it remains questionable whether the effects can be generalized to other groups. Therefore, we aimed to test whether the effects replicate in a different group, namely students. Further, the correlational design of the study, does not allow

testing whether willpower theories affect well-being or vice versa. To answer this question we chose a longitudinal design for the second study.

Study 2

The purpose of this study was to examine whether a limited theory about willpower is related to lower well-being in a sample of undergraduate students and whether it predicts decreases in subjective well-being as self-regulatory demands increase. At the university where the study was conducted, students have to pass multiple written exams at the end of their first year to be able to continue their studies. The simultaneous increase in self-regulatory demands among first year students allowed testing whether willpower theories predict change in well-being as self-regulatory demands increase. Thus, we measured willpower theories and subjective well-being at the beginning of students' first year and a second time 6 months later at the end of their first year when exams approached.

Another purpose of this study was to rule out that effects of willpower theories on subjective well-being can be attributed to differences in trait self-control, which refers to stable individual differences in the capacity to exert self-control (Tangney et al., 2004). Recent research suggests that trait self-control is positively related to subjective well-being (Hofmann et al., 2013). People with high trait self-control tend to experience higher life satisfaction and affective well-being (Hofmann et al., 2013). Further, research suggests that implicit theories about willpower show moderate overlap with trait self-control, such that people with a limited theory have lower trait self-control (Job et al., 2015).

The most prominent measure for trait self-control, the Trait Self-Control Scale (Tangney et al., 2004), assesses self-control in different domains (e.g., ability to resist temptations, ability to control emotions). To preclude that a lack of overlap between the two measures can be

attributed to a domain-specific assessment of willpower theories, we used a more comprehensive measure of implicit theories about willpower than in Study 1. Particularly, we assessed beliefs about willpower in three different domains of self-control (i.e., strenuous mental activities, resisting temptations, and emotion control).

Further, we assessed implicit theories of intelligence as a possible third variable. A meta-analysis of studies within the achievement domain linked an incremental theory (across multiple attributes) to less negative emotions (Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013). However, there is no evidence so far for a link between theories of intelligence and subjective well-being. Because exams present a possible self-threat to people with a fixed theory of intelligence, we predict that a fixed theory is related to lower well-being and a negative trend in well-being towards the end of a term. Because we assume a different mechanism for the effect of willpower theories on well-being, namely goal progress, the effect of implicit theories of willpower on trends in well-being should be independent of the effect of theories about intelligence on subjective well-being.

Method

The present study was part of a larger research project on implicit theories about willpower and self-control. The measures of interest for this research question were administered at the third and fourth measurement point, which was an online questionnaire (T_1), located in the beginning of students' first year and a lab session six months later at the end of the first year (T_2).[2] For each measurement point (60 minutes) participants received 20 Swiss Francs ($22 USD) or course credits.

Participants

First year students of a Swiss university were recruited with posters and flyers on campus and through announcements in lectures. At T_1, n = 196 students (147 female, 47 male, 2 no indication, M_{age} = 21.5, range$_{age}$ = 18-51 years) participated in the study. Six months later at the end of their first year (T_2), n = 162 students (17.4% dropout) filled in the dependent measures.

We conducted dropout analyses using two-sample *t*-tests to test for sample selectivity. The analyses indicated that individuals who dropped out from the study (coded as 1) endorsed more of a limited theory, $t(195) = -2.34$, $p = .023$, but did not differ in their trait self-control, $t(195) < 1$, *ns*., from people who remained in the study (coded as 0). Further, people who dropped out had slightly lower subjective well-being, $t(195) = 1.70$, $p = .095$, and lower affective well-being (combined scale), $t(195) = 1.91$, $p = .063$, at the beginning of their first year.

Measures and Procedure

Implicit theories about willpower. Implicit theories about willpower were assessed with a more comprehensive measure compared to Study 1. We used the same six items as described in Study 1 to assess implicit theories about willpower in the domain of strenuous mental activities. Additionally, two sets of four items assessed willpower theories in the domain of resisting temptations (e.g., "It is particularly difficult to resist a temptation when you had to resist another temptation right before", "It doesn't matter how many temptations you are faced with consecutively, your willpower to resist them is still the same" [recoded]; Job et al., 2010), and in the domain of emotion control (e.g., "Having to control a strong emotion makes you exhausted and you are less able to manage your feelings right afterwards", "Even if you had to keep cool and control your emotions in several different situations in a day, it does not affect your ability to control your emotions in a new situation" [recoded]).[3] Participants indicated how much they

agreed with each item on a 6-point scale (1 = *Strongly disagree*; 6 = S*trongly agree*). Again, high values on the averaged measure represent higher agreement with a limited theory about willpower (α_{T1} = .72; α_{T2} = .80).

Subjective well-being. Subjective well-being was assessed with the German version of the WHO-5 well-being index (Brähler, Mühlan, Albani, & Schmidt, 2007). The scale consists of five items (e.g., "Over the past week...my life has been full of things that interest me"; "...I have felt cheerful and in good spirits"), which participants rated with reference to the previous week on a 6-point scale (1 = *All the time*; 6 = *At no time*). All items were reverse scored such that high scores on the averaged index represent higher subjective well-being (α_{T1} = .81; α_{T2} = .83). Because the items of the WHO-5 index represent a mixture of items assessing life satisfaction and affective well-being, we refer to the final measure as subjective well-being.

Affective well-being. Additionally, we assessed affective well-being with the Multidimensional Mood Scale as described in Study 1 (Steyer et al., 1997). Participants indicated on 16 items how they felt within the past week on a 5-point scale (1 = *Not at all*; 5 = *Very much*). The items assessed positive and negative mood states on three dimensions, namely pleasantness (pleasant versus unpleasant), alertness (awake versus tired), and serenity (calm versus stressed; $\alpha s_{T1} > .78$; $\alpha s_{T2} > .80$). High scores on each subscale reflect positive mood. As in Study 1, we calculated a combined mood index covering all three mood dimensions by averaging all 16 items (α_{T1} = .90; α_{T2} = .91).

Trait self-control. Trait self-control was assessed with the German version of the Trait Self-Control Scale (Bertrams & Dickhäuser, 2009; Tangney et al., 2004). The scale consists of 13 items (e.g. "I am good at resisting temptation", "I do certain things that are bad for me, if they are fun" [recoded]). Participants were asked to rate each item with respect to how much it

reflected their typical behavior on a 5-point scale (1 = *Not at all like me*; 5 = *Very much like me*). On the averaged scale high values represent higher trait self-control (α_{T1} = .77; α_{T2} = .82).

Implicit theories about intelligence. Implicit theories about intelligence were assessed at baseline with five items (e.g., "You have a certain amount of intelligence and you really cannot do much to change it." [reverse scored]) (Dweck, 1999; Spinath, 2001). Participants rated how much they agree with each statement on a 6-point scale (1 = *Strongly agree*; 6 = *Strongly disagree*). On the averaged scale high values represent a fixed theory (α_{T1} = .93).

Results

Cross-sectional analyses. Descriptive statistics and bivariate correlations for the main variables are summarized in Table 2. First, implicit theories about willpower at T_1 and T_2 were moderately correlated, suggesting that implicit theories about willpower were moderately stable over a period of 6 months. Second, replicating the findings of Study 1, implicit theories about willpower at T_1 were significantly correlated with subjective and affective well-being at T_1. Again, the more participants endorsed a limited theory, the lower was their well-being. Third, there was a significant negative correlation between implicit theories about willpower and trait self-control, both at T_1 and T_2. Replicating previous research, people who agreed more with a limited theory reported to have lower trait self-control (Job et al., 2015). Trait self-control was positively related to well-being at T_1 and T_2 replicating previous research (Hofmann et al., 2013). However, trait self-control T_1 was not correlated with well-being at T_2, suggesting that trait self-control does not predict well-being over a longer time period in which demands increase.

Finally, willpower theories and theories about intelligence were not significantly correlated. Implicit theories about intelligence were significantly correlated to subjective well-

being. An incremental theory was related to higher levels of subjective well-being. The correlations with affective well-being did not reach significance.

Longitudinal analyses. We predicted that implicit theories about willpower would predict change in well-being over the course of students' first year, because self-regulatory demands should increase at the end of the year when final exams approach. To test this hypothesis, we conducted a hierarchical regression analysis of well-being at T_2, controlling for well-being at T_1 and trait self-control at T_1 in the first block. Implicit theories about willpower at T_1 were entered in the second block. All predictor variables were standardized. As summarized in Table 3 (Step 1), trait self-control did not consistently predict residual change in subjective or affective well-being, while implicit theories about intelligence predicted change in well-being more consistently. An incremental theory was related to a positive change in subjective and affective well-being across indicators (marginally significant for subjective well-being and calm vs. stressed mood states). In Step 2, willpower theories significantly predicted residual change in subjective and affective well-being over and above trait self-control and implicit theories about intelligence. A limited theory about willpower was associated with a negative trend in subjective and affective well-being. One exception was the subscale measuring calm versus stressed mood states. Here, the effect of willpower theories did not reach significance.

To estimate an average effect size, we z-transformed the four measures of well-being and averaged them into one index for each time point. The effect of willpower theories on well-being at T_2 was significant, $\beta = -.21$, $se = .14$, $p = .008$, $f^2 = .04$, controlling for well-being at T_1, $\beta = .44$, $se = .08$, $p < .001$, and trait self-control, $\beta = -.19$, $se = .13$, $p = .020$, and theories about intelligence, $\beta = -.18$, $se = .06$, $p = .020$ (Figure 1). According to Cohen's (1988) convention, effects of $f^2 = .02$ are considered small effects and $f^2 = .15$ medium effects. Thus, willpower

theories had a small effect on change in subjective and affective well-being over the course of students' first year.[4]

Last, we tested the opposite direction of the effect, that is, whether previous well-being predicted change in willpower theories. We ran two hierarchical regression models predicting willpower theories at T_2 by life satisfaction at T_1 (or affective well-being at T_1), controlling for willpower theories at T_1 and trait self-control at T_1. As expected, change in willpower theories was not predicted by previous life satisfaction, $\beta = -.02$, *se* = .04, $p = .500$, or by affective well-being, $\beta = -.06$, *se* = .04, $p = .180$.

Discussion

Study 2 tested whether willpower theories predict change in subjective well-being over the course of students' first year in college. Based on previous research, we assumed that demands increase over the course of the first year when final exams approach (Job et al., 2015; Oaten & Cheng, 2005). As expected, a limited theory about willpower predicted a negative trend in subjective well-being from a period with low demands (i.e., beginning of the first year) to a period with high demands (i.e., final exam period at the end of the first year). One exception was the mood dimension measuring whether participants felt calm versus stressed. Theories about willpower did not predict whether students became more stressed towards the end of the first year. This finding adds to evidence from previous research that willpower theories are not correlated with reported self-regulatory demands (Job et al., 2015).

The effects of willpower theories on change in well-being were independent of trait self-control and implicit theories about intelligence. Willpower theories were related to trait self-control but not to implicit theories about intelligence. Predicting change in well-being, endorsing a fixed theory about intelligence predicted negative change in well-being over the course of the

first year whereas trait self-control was not consistently related to change in well-being. Surprisingly, when implicit theories for intelligence and willpower were controlled, high trait self-control predicted negative change in well-being. This finding suggests that variance in trait self-control that is not shared with willpower theories and theories of intelligence predict a negative trend in well-being, and, therefore, is not inconsistent with previous findings documenting a positive link between trait self-control and well-being (Hofmann et al., 2013).

One limitation of the present study is the selective dropout that resulted in a sample of people with more of a nonlimited theory and higher well-being at the beginning of the study. This limits the generalization of the findings and calls for replication of the findings. Further, Study 1 and 2 had a common methodological shortcoming. Subjective well-being was assessed with retrospective self-reports and asked participants to recollect their affective experience for a relatively long time period (i.e., one week). Research shows that people are not very accurate in their recall of affective experiences, which is why more intense measurement designs are recommend for the study of well-being (Diener et al., 1999; Diener, 2013; Fredrickson & Kahneman, 1993). We conducted Study 3 to replicate our findings using a daily diary design.

Study 3

The purpose of this study was threefold. First, we aimed to replicate the finding that a limited theory predicts lower levels of well-being using a daily diary method to measure subjective well-being in a nondemanding phase (i.e., beginning of a term) and in a demanding phase (i.e., final exam period). Based on the previous findings, we expected that a limited theory predicts lower subjective well-being during the final exam period.

Second, Study 3 aimed to test the proposed mechanism explaining why a limited theory leads to lower subjective well-being as demands increase. Previous research found that people

with a limited theory report lower self-regulation with regard to challenging personal goals at the end of the term (Job et al., 2010). Assuming that personal goal striving is impaired in people with a limited theory when demands increase, they should make less goal progress during this time. Goal progress predicts people's subjective well-being (Klug & Maier, 2014). Thus, we examined whether willpower theories are related to differences in goal striving and personal goal progress over time and whether this progress mediates the link between willpower theories and well-being.

Third, we wanted to rule out additional third variables, namely, optimism, pessimism, and self-efficacy, which might account for the relationship between willpower theories and well-being. Dispositional optimism (pessimism) is defined as stable expectancies of future positive (negative) outcomes and has been found to be associated with subjective well-being (Lyubomirsky, 2001; Scheier & Carver, 1987, 1992). Self-efficacy reflects people's general beliefs in their ability to influence events that affect their lives and has been found to be adaptive for emotional well-being, particularly when people have to deal with distressing and threatening life events (Bandura, 2009). Although we expected that willpower theories are correlated with these constructs (people with a limited theory have lower optimism, higher pessimism, and lower self-efficacy), controlling for these variables should not affect the link between willpower theories and subjective well-being.

Method

Participants and Procedure

Participants were n = 157 students from a public university in Switzerland (132 women; M_{age} = 22.96 years, range$_{age}$ = 18-51 years) who were recruited via lectures, flyers on campus, mailing lists, and online forums for students. After signing up for the "smartphone study on well-

being" via email, participants received a link to the baseline survey during the 3rd week of the spring term.

In the nine weeks following the baseline survey, participants completed two separate diary phases. Each phase consisted of five consecutive work days (Monday to Friday). The first diary phase was located in the lecture period at beginning of the spring term (6th of 15 weeks) and the second diary phase in the exam period at the end of the spring term (13th week). On each day participants filled in two short online surveys, one in the morning and one in the evening. The dependent measures of interest for this study were only assessed in the evening survey. Participants were emailed a link to the evening survey at 6:00 pm with the request to answer until 11:00 pm, when the link expired. Two weeks after the last diary phase participants filled in another follow-up survey online.

In compensation participants received 20 Swiss Francs ($22 USD) for completing the baseline and follow-up survey, 10 Swiss Francs ($11 USD) for completing each diary phase, and a 20 Swiss Francs ($22 USD) bonus for completing 80% of the daily surveys. Overall, 1390 out of 1570 evening surveys were completed (88.5 %). Only 3 participants dropped out between the baseline survey and the first diary phase and another 17 participants between the last diary phase and the follow-up survey.

A series of *t*-tests examined whether participants who dropped out over the course of the study differed in any baseline variable from those participants who remained in the study. Participants who dropped out did not differ in any measure assessed at baseline, $t(155) < 1.2$, *ns*, except for goal progress at baseline, $t(155) = -2.14$, $p = .034$. Those who dropped out reported less progress in personal goals at baseline ($M = 3.10$, $SD = 0.70$) compared to participants who remained ($M = 3.47$, $SD = 0.73$).

Baseline Survey

Implicit theories about willpower. At baseline participants completed six items assessing implicit theories about willpower in the domain of strenuous mental activities and six items assessing implicit theories about willpower in the domain of resisting temptations (Job et al., 2010; α = .76).

Optimism and pessimism. To examine whether the effects of implicit theories about willpower were independent of optimism and pessimism, we administered the German version of the revised Life Orientation Test (LOT-R; Glaesmer, Hoyer, Klotsche, & Herzberg, 2008; Herzberg, Glaesmer, & Hoyer, 2006). Participants indicated on a 5-point scale (*1 = Strongly disagree, 5= Strongly agree*) how much they agreed with three items assessing optimism (e.g., "In uncertain times, I usually expect the best", α = .68) and three items assessing pessimism (e.g., "If something can go wrong for me, it will", α = .62). Because optimism and pessimism have been found to represent two independent constructs, the respective items were averaged to two separate scales (Glaesmer et al., 2008; Herzberg et al., 2006).

General self-efficacy. The baseline questionnaire assessed general self-efficacy with the German version of the General Self-efficacy Scale (Chen, Gully, & Eden, 2001; Schwarzer, Bässler, Kwiatek, Schröder, & Zhang, 1997). Participants answered 10 items (e.g., "I can always manage to solve difficult problems if I try hard enough", α = .77) on a 4-point scale (*1 = Not at all true*, *4 = Exactly true*).

Subjective well-being. Life satisfaction was assessed with the Satisfaction with Life Scale as describes in Study 1 (α = .82). Further, affective well-being was assessed with the Multidimensional Mood Scales as described in Study 1. For the purpose of brevity, the mood dimensions were combined to one measure (α = .77).

Goal progress. To assess participant's progress on their personal goals over the course of the term, we followed a idiographic-nomothetic approach (Brunstein, 1993). Because all participants were students, we assessed progress with regard to the personal goal "to successfully pursue their studies". Additionally, participants generated another study or work-related goal and one leisure-related goal they pursued within the next three months. Then they rated their progress on these three personal goals on one item, namely "In recent times, I have made a great deal of progress concerning this goal" (1 = *Not at all true*; 5 = *Absolutely true*; adapted from Brunstein, Schultheiss, & Grässmann, 1998). We averaged the three items on goal progress for the three personal goals (α = .50).

Daily Diary Measures

Subjective well-being. Daily well-being was assessed with the German version of the WHO-5 Index (Bech, Olsen, Kjoller, & Rasmussen, 2003; Brähler et al., 2007) as described in Study 2 (αs = .82-.89).

Effective goal striving. We designed a daily measure of effective goal striving that was independent of participants three personal goals, because we feared that participants would not work on their goals on an daily basis, resulting in insufficient variance. Therefore, we asked participants in general how effectively they had worked throughout the day and how often they had worked on things that were important to them (i.e., "Overall how efficiently have you worked today?", 1 = *Not at all*, 5 = *Very much*; "How often did you work on things that are important to you? 1 = *All the time*, 6 = *At no time*). The measures were significantly correlated (*rs* > .49) and averaged to one measure of effective goal striving.

Demands. As an objective within-person measure of demands we dummy-coded the period of the term in which the diary was completed (0 = *Lecture Period*, 1 = *Exam Period*).

Another variable coded the order of days (0 = *1st day*, 9 = *10th day*). To cross-validate whether the exam period was experienced as more demanding, we included a daily measure of demands (i.e., "Overall, how demanding was your day?", 1 = *Not at all*, 5 = *Very much*).

Follow-up Survey

Subjective well-being. Similar to the baseline survey, life satisfaction was assessed with the Satisfaction with Life Scale (α = .83; Diener et al., 1985; Glaesmer et al., 2011), and affective well-being with the Multidimensional Mood Scales (α = .81; Steyer et al., 1997).

Goal progress. Goal progress was assessed with regard to the three personal goals participants had named in the baseline survey. The study goal and the two individual goals were presented and participants rated their goal progress on the same item administered in the baseline survey and three additional items (i.e., "In recent times...I have hardly made any progress in the attempt of advancing in this goal." [reverse scored]; "...I was successful in the pursuit of this goal", "...lots of my efforts to advance this goal failed" [reverse scored], *1 = Not at all true*; *5 = Absolutely true*; adapted from Brunstein, 1993). We averaged the 12 items (4 items per goal) into one indicator of personal goal progress (α = .85).

Results

Descriptive statistics and correlations. The descriptive statistics and correlations of the main variables are presented in Table 4. As predicted, implicit theories were significantly correlated with optimism and self-efficacy. Students with a limited theory were less optimistic and had lower self-efficacy. The correlation with pessimism was not significant. Replicating Study 1 and 2, willpower theories were significantly correlated with baseline levels of subjective well-being and the person-mean of well-being assessed in the diary phase. People with a limited

theory reported lower levels of well-being. Further, willpower theories were associated with goal progress and effective goal striving. People with a limited theory reported lower goal progress.

Diary Data Analyses

Demands. First, we tested the assumption that demands increased over the course of the term. Because diary data were nested within participants, we ran a random-intercept multilevel model to test this assumption (Bryk & Raudenbush, 1992). In the model, the daily level of demands was predicted by phase of term (centered at the beginning of term) and the day of the diary (centered at first day of the diary phase) both entered at the day level. The phase of the term was positively and significantly associated with demands, $b = 0.44$, $se = 0.10$, $t(1229) = 4.35$, $p < .001$, suggesting that demands were higher in the second diary phase located at the end of the term. The incremental effect of the day was negative, $b = -0.04$, $se = 0.02$, $t(1229) = -2.23$, $p = .026$, showing that demands decreased towards the end of each diary week.

Subjective well-being. Next, we tested whether willpower theories predicted subjective well-being, particularly at the end of the term. In the random-intercept multilevel model daily well-being was predicted by willpower theories (grand-mean centered), phase of term (centered at beginning of term) and their cross-level interaction. Additionally, we controlled for optimism, pessimism, and self-efficacy (grand-mean centered), and day of the diary at the day-level (centered at first day). The main effect of willpower theories was not significant, $t < 1$, *ns*, while the main effect of phase of term was significant, $b = -0.63$, $se = 0.09$, $t(1246) = -7.21$, $p < .001$. Overall, well-being was significantly reduced in the exam period compared to the lecture period. Consistent with our hypothesis, the interaction effect was significant, $b = -0.20$, $se = 0.09$, $t(1246) = -2.40$, $p = .017$. The more participants endorsed a limited theory the lower was their subjective well-being in the exam period (Figure 2). Simple slope analyses (Preacher, Curran, &

Bauer, 2006) showed that well-being decreased over the course of the term for students with a nonlimited theory and students with a limited theory, b = -.42, se = 0.12, z = -3.49, $p < .001$, and, b = -0.83, se = 0.12, z = -6.89, $p < .001$, respectively. However, in the final exam period students with a nonlimited theory reported higher well-being than students with a limited theory, b = -0.24, se = 0.11, z = -2.16, $p = .031$, whereas there was no difference in the lecture period, b = -0.04, se = 0.05, z = -0.74, $p = .454$. The effects were independent of the effects of optimism b = 0.13, se = 0.05, $t(149) = 2.85$, $p = .005$, pessimism, b = -0.11, se = 0.04, $t(149) = -2.54$, $p = .012$, and self-efficacy, b = 0.16, se = 0.04, $t(149) = 3.75$, $p < .001$, on daily well-being.

Effective goal striving. Further, we expected that willpower theories predict effective goal striving, particularly at the end of the term. This hypothesis was tested using a similar random-intercept multilevel model as reported above but predicting daily effective goal striving. The effect of phase was significant, b = 0.32, se = 0.09, $t(1225) = 3.81$, $p < .001$. People worked more effective at the end of the term. The main effect of willpower theories was not significant, b = -.08, se = 0.05, $t(149) = -1.64$, $p = .103$, but the interaction with phase of term was significant, b = -0.21, se = 0.09, $t(1225) = -2.42$, $p = .016$. During the exam period students with a nonlimited theory reported more efficient goal striving than students with a limited theory (Figure 3). People with a nonlimited theory reported to be significantly more effective in their goal striving in the exam period, b = .53, se = 0.12, z = 4.43, $p < .001$. This was not the case for people with a limited theory, b = .11, se = 0.12, z = 0.92, $p = .355$. In the exam period, willpower theories significantly predicted reported goal striving efficiency, b = -.29, se = 0.11, z = -2.64, $p = .008$, but not in the lecture period, b = .13, se = 0.08, z = 1.57, $p = .116$.

Baseline and Follow-up Data Analyses

Mediation analyses with goal progress (follow-up data). We hypothesized that willpower theories affect subjective well-being via goal progress. The proposed indirect effect was tested using the baseline and follow-up data. The data was analyzed using the PROCESS (model 4) macro version 2.12.1 (Hayes, 2013). For the product estimation of the indirect effect (*a*b path*) the macro estimates two models: A mediator model for the *a path* (effect of willpower theories on goal progress) and a dependent variable model for the *b path* (effect of goal progress on subjective well-being). The point estimate and the 95% confidence interval for the indirect effect are estimated with the bootstrap method.

We ran two separate analyses for change in life satisfaction and change in affective well-being. Because we expected that *change* in goal progress mediates *change* in well-being, we used a residual change measure of goal progress as mediator estimated by regressing follow-up goal progress on baseline goal progress (z-standardized). Further, we controlled for baseline well-being in the dependent variable model as well as for optimism, pessimism, and self-efficacy in the dependent variable model, but none showed a significant effect, *ts* < |1.20|, *ns*.

In the mediator model the *a path* was estimated by predicting residualized change in goal progress by willpower theories (z-standardized). As expected, willpower theories significantly predicted change in goal progress, $b = -0.12$, $se = 0.05$, $t(133) = -2.27$, $p = .025$, 95% CI [-.224; -.016]. People with a limited theory made less progress on their personal goals over the course of the term. [5]

The *b path* was estimated in the dependent model predicting change in life satisfaction by willpower theories and goal progress, controlling for optimism, pessimism, and self-efficacy (all z-standardized). As expected, change in personal goal progress had a significant effect on change in life satisfaction, $b = 0.19$, $se = 0.10$, $t(128) = 2.00$, $p = .048$, 95% CI [.003; .385]. The 95%

confidence interval of the bootstrapped (5000 samples) indirect effect did not include zero, b = -0.03, se = 0.01, 95% CI [-.067; -.003], suggesting that willpower theories have an indirect effect on life satisfaction through personal goal progress.

For change in affective well-being, the effect of goal progress was not significant (*b path*), b = 0.09, se = 0.07, $t(128) = 1.28$, p = .203, 95% CI [-.049; .231], and the confidence interval for the indirect effect included zero as possible value, b = -0.01, se = 0.01, 95% CI [-.040; .007]. This suggests that personal goal progress mediated the effect of willpower theories on life satisfaction but not on affective well-being.

Mediation analyses with goal striving (diary data). We ran the same set of mediation analyses for the daily measure of efficient goal striving, because we were interested whether the change in effective goal striving from the beginning to the final exam period might affect students' change in subjective well-being over the course of the term. To be able to analyze the data in the PROCESS macro, we calculated a personal mean of daily effective goal striving for the first and the second diary phase and then estimated a residual change measure by regressing effective goal striving in the final exam period on effective goal striving from the beginning of the term. The residual change measure was then entered as mediator. Again we ran separate mediation analyses for change in life satisfaction and change in affective well-being.

In the mediator model, willpower theories predicted residual change in effective goal striving (*a path*), b = -0.25, se = 0.08, $t(135) = -3.04$, p = .003. In the dependent variable model predicting life satisfaction, the effect of residual change in effective goal striving was significant (*b path*), b = 0.14, se = 0.06, $t(129) = 2.24$, p = .027. The confidence interval of the indirect effect of willpower theories on change in life satisfaction mediated through change in effective goal striving did not include zero, b = -0.04, se = 0.02, 95% CI [-.086; -.007].

In the dependent variable model for change in affective well-being, the effect of change in effective goal striving was not significant (*b path*), $b = 0.07$, $se = 0.05$, $t(127) = 1.55$, $p = .122$, and the confidence interval of the indirect effect included zero as plausible effect, $b = -0.02$, $se = 0.01$, 95% CI [-.031; .001].

In sum, willpower theories seem to indirectly affect change in life satisfaction through change in goal progress and change in effective goal striving. The indirect for affective well-being did not reach significance.

Examining alternative mediation models. Finally, we tested alternative mediation models, but the indirect effects in these models all included zero as possible indirect effect. First, we tested willpower theories as mediator for the effect of residual change in goal progress on change in life satisfaction but the indirect effect was not significant, $b = 0.005$, $se = 0.03$, 95% CI [-.046; .055]. Next, we tested willpower theories as mediator for the effect of residual change in daily effective goal striving on change in life satisfaction but again the indirect effect was not significant, $b = 0.005$, $se = 0.03$, 95% CI [-.044; .067]. In sum, these alternative analyses support the proposed mediation model.

Discussion

Replicating the findings of Study 2, the present study showed that at the end of the term, when self-regulatory demands increased, students with a limited theory experienced lower subjective well-being than students with a nonlimited theory. Further, the study ruled out optimism, pessimism, and general self-efficacy as possible third variables. Although willpower theories were correlated with optimism and general self-efficacy (students endorsing a limited theory being less optimistic and having lower self-efficacy), the effects were independent of these variables. Further, the study provides first evidence for the idea that effective goal striving

and goal progress play a mediating role in the relationship between willpower theories and subjective well-being. First, students with a nonlimited theory reported more effective goal striving (assessed in the diary phase) at the end of the term than students with a nonlimited theory. Further, students with a nonlimited theory reported more progress on three personal goals over the course of the term. Change in effective goal striving (from beginning to end) and change in personal goal progress (from beginning to end of term) were both positively related to change in life satisfaction (but not affective well-being). The inability to become more effective in striving for their personal goals as demands increase and the lower personal goal progress seem to be part of the mechanism explaining why people with a limited theory experience lower life satisfaction. However, change in goal progress and effective goal striving were both not related to change in affective well-being. Meta-analytic findings suggest that goal progress should have been equally related to measures of life satisfaction and affective well-being (Klug & Maier, 2014). Therefore, we refrain from interpreting this non-significant effect as suggesting a different mechanism for the relationship between willpower theories and affective well-being, but rather attribute it to random error variance.

General Discussion

The present research examined the relationship between beliefs about willpower and people's subjective well-being. We proposed that people with a limited theory, those who believe that their willpower is a limited resource, experience lower levels of well-being, because they make less progress on their personal goals. Further, we expected that as self-regulatory demands increase people with a limited theory experience a downward trend in their subjective well-being, because their self-regulation is increasingly impaired and they make less progress towards their personal goals.

Three studies examined these hypotheses. In Study 1, endorsing a limited theory about willpower was associated with lower levels of life satisfaction and affective well-being in a sample of working adults. Longitudinal Study 2 showed that a limited theory was related to a negative trend in well-being over the course of students' first year in college. The effects were independent of participant's level of trait self-control and implicit theories about intelligence. We assumed that towards the end of the first year, self-regulatory demands increased due to commencement of exams and students with a limited theory were less able to self-regulate and make progress towards important goals. Study 3 directly tested this assumption. We used a daily diary method with two diary phases, one administered at the beginning of a term and one during the final examination period. Replicating the findings of Study 2, students with a limited theory reported lower subjective well-being, particularly in the week prior to their final exams.

Further, daily measures of successful goal striving suggest that students with a nonlimited theory became more efficient in their goal striving towards end of the term, whereas students with a limited theory remained at a low level. We also measured students' progress in three personal goals over the course of the term. As predicted, students with a nonlimited theory, those who were more efficient in goal striving in the phase before their exams, also made greater progress towards their personal goals. This goal progress was in turn positively related to change in life satisfaction over the course of the term, which replicates previous research (Klug & Maier, 2014). The effects were independent of optimism, pessimism, and self-efficacy.

Theoretical Contribution

Previous research showed that believing that willpower is a limited resource has detrimental effects on self-regulation in everyday life and thereby also affects achievement-related outcomes, such as students' grades (Job et al., 2015). The present studies extend these

findings, suggesting that the belief that willpower is a limited resource has downstream effects on people's subjective well-being as well. In line with previous findings showing that willpower theories matter for self-regulation particularly when self-regulatory demands increase (Job et al., 2015), we found that a limited theory was associated with a downward trend in subjective well-being over a period of time when self-regulatory demands increased. That means that over and above their baseline association with subjective well-being, a limited theory predicts a negative trend in well-being, when demands increase. Corroborating previous findings, willpower theories did not predict students' perceived stress. Previous studies already showed that willpower theories are not related to the objective amount of self-regulatory demands students face or how exhausting a self-regulatory task is perceived (Job et al., 2010, 2015). Willpower theories seem not to affect how self-regulatory demands are perceived but whether people are able to efficiently strive for their personal goals as self-regulatory demands accumulate.

In two studies, we were also able to rule out several third variables that might account for the relationship between willpower theories and subjective well-being, namely trait self-control, implicit theories about intelligence, optimism, pessimism, and self-efficacy. Although willpower theories showed significant overlap with trait self-control, optimism, and self-efficacy (people with a limited theory had lower trait self-control, optimism, and self-efficacy), controlling for these variables did not change the pattern of results. These findings suggest that willpower theories have an incremental value in predicting subjective well-being over and above other important personality constructs. However, since willpower theories were not manipulated but measured in the present studies, we cannot completely rule out that other third variables might account for the relationship between willpower theories and well-being, such as neuroticism or implicit theories about personality (whether a person's personality is fix or malleable). Thus,

future studies should investigate whether willpower theories correlate with the Big Five and other implicit theories (e.g., Hayes & Joseph, 2003; Schroder et al., 2014).

Another theoretically important finding of the present research is that people with a nonlimited theory seem to become *more* efficient in their personal goal striving as demands increase, instead of becoming less efficient as people with a limited theory. Previous research has already examined willpower theories and everyday self-regulation, but only within a demanding period (Job et al., 2015), or mean level changes of self-regulation were not depicted separately for periods with low versus high demands (Job et al., 2010). Study 3 used a daily diary method to assess self-regulation in a period with low demands (i.e., lecture period) and high demands (i.e., final exam period). The pattern of results suggests that people with a nonlimited theory become more efficient in their personal goal striving in the lecture period, whereas people with a limited theory remained at the same low level they had reported in the lecture period. Importantly, the increase in successful goal striving over the course of the term was positively related to change in life satisfaction. Thus, the increase in efficiency seems to be adaptive not only in terms of achievement (Job et al., 2015), but also in terms of well-being.

Practical Implications

One practical implication of the present research is that willpower theories might matter for subjective well-being in certain groups of people who face high self-regulatory demands, such as people with chronic diseases like diabetes (Bernecker & Job, 2015), people trying to lose weight, people with jobs that demand a great deal of emotion regulation (e.g., teachers, nurses), or young parents. For instance, it would be interesting to test whether willpower theories predict the extent to which young parents remain able to strive for personal goals and do things that are personally important and whether this in turn affects their subjective well-being. Further, future

research should test whether willpower theories predict the development of a burnout syndrome in jobs that involve relatively high demands in emotion regulation (Bauer et al., 2006; Poncet et al., 2007). A nonlimited theory in the domain of emotion regulation might be particularly adaptive among teachers and nurses and prevent the onset of burnout and/or promote well-being in these groups.

Hence, a question of practical relevance is whether beliefs about willpower can be changed. Although we found that willpower theories were stable over a period of six months within a natural setting, it is possible that a targeted intervention might be able to change the way people think about their willpower. Previous lab studies already documented that willpower theories can be manipulated with a simple technique and found that the effects of manipulated willpower theories on self-control performance mirrored the effects that were observed with measured willpower theories (Job et al., 2010). As a next step, field experiments should investigate whether people can learn to adopt a nonlimited theory for a longer period of time and whether this contributes to their everyday self-regulation, achievement, and well-being. The present findings suggest that a willpower theory intervention would be particularly effective in phases in which participants face high self-regulatory demands, such as during final exams or when students have to master demanding academic transitions (Blackwell et al., 2007). In the past, interventions targeting people's implicit theories about intelligence and personality have been effective in improving outcomes such as academic achievement or adolescent aggression (Aronson, Fried, & Good, 2002; Blackwell et al., 2007; Yeager, Trzesniewski, & Dweck, 2013). The methods used in these interventions might inform future willpower-theory interventions. Apart from the practical relevance of such an intervention, the manipulation of willpower

theories in the field would also allow testing the proposed effect of willpower theories on well-being in a methodologically more rigorous way.

Limitations and Future Directions

One limitation of the present research is the selective dropout that was present in two studies. Selective dropout reduces the variance in a sample, which limits the generalizability of the findings, because the effect size is likely to be underestimated. In Study 2, the final sample was selective with regard to willpower theories. Participants with a nonlimited theory were more likely to fill in the last measurement point, which was located within a demanding phase of the term. This is not surprising, since previous studies showed that a limited theory is associated with reduced self-regulation, one would expect that students with a limited theory would be more likely to fail to fill in follow-up questionnaires. Thus, future studies might increase the incentives for measurement points that are located within such phases in order to avoid selective dropout. Further, future studies might complement self-report measures particularly for the assessment of goal progress and effective goal striving with behavioral measures. For instance, it might be possible to assess goal progress with regard to one specific personal goals, such as "losing weight" and assessing objective indicators for goal progress, i.e., weight loss (e.g., Koestner, Otis, Powers, Pelletier, & Gagnon, 2008). Such a homogenous goal across participants would result in reduced error variance. Examining one specific goal, however, limits the generalizability of the findings.

Conclusion

Three empirical studies demonstrated that implicit theories about willpower affect individuals' subjective well-being. People who believed that their willpower is nonlimited experienced higher levels of well-being than people who believed that their willpower is limited.

These findings suggest that the previously documented functionality of the nonlimited theory for self-control performance and academic achievement can be extended to well-being. A nonlimited theory about willpower encourages people to successfully strive for and make progress towards personally meaningful goals. This investment pays off in terms of higher subjective well-being.

Declaration of Conflicting Interests

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Footnotes

[1] The study was part of a larger research project on implicit motives and burnout, therefore the sample was recruited on these forums. The study included the variables of interest for the research question among other variables.

[2] The study tested the effect of a manipulation on self-control performance which was administered at the second measurement point. The manipulation did not affect measures of subjective well-being, Fs < 1, and the manipulation was controlled in all main analyses.

[3] The subscale on implicit theories about emotion control can be requested from the corresponding author.

[4] Additionally, we ran the cross-sectional and longitudinal analyses separately for the three subscales of willpower theories to see whether domain (strenuous mental activities, resisting temptations, emotion regulation) affected the relationship with well-being. The subscales did not substantially differ in their cross-sectional relationship with well-being, rs =-.14 to -.17, ps < .05, and their predictive power for change in well-being, βs = -.11 to -.15, ps = .043 to .154.

[5] We ran additional analyses to test whether the effects described differed for the three goal domains (study goal, study/work-related goal, leisure goal). Willpower theories were significantly related to progress in the study goal, β = -.23, p = .005, and descriptively related to progress in the study/work-related goal, β = -.12, p = .147, and leisure goal, β = -.07, p = .421. It seems plausible that the study goal and the study/work-related goal require more self-regulation than the leisure goal and therefore willpower theories were a better predictor for progress on these goals.

Figure Captions

Figure 1. Results of a hierarchical regression model predicting subjective well-being at the end of the term by willpower theories, controlling for beginning-of-term well-being and trait self-control (Study 2). Error bars represent +/-1 SE.

Figure 2. Result of a random-intercept model predicting levels of subjective well-being by phase of term and willpower theories (Study 3). Error bars represent +/-1 SE.

Figure 3. Result of a random-intercept model predicting effective goal striving by phase of term and willpower theories (Study 3). Error bars represent +/-1 SE.

Table 1

Descriptive Statistics and Zero-Order Correlations for the Main Variables of Study 1

Variable	*M (SD)*	1	2	3	4	5
1. Willpower Theories	3.77 (0.86)					
2. Life Satisfaction	4.65 (1.36)	-.36				
3. Mood Pleasant-Unpleasant	3.43 (1.19)	-.34	.55			
4. Mood Awake-Tired	2.98 (1.19)	-.32	.45	.79		
5. Mood Calm-Stressed	3.15 (1.12)	-.33	.46	.77	.76	
6. Mood Combined	3.24 (1.09)	-.36	.54	.96	.90	.89

Note. High scores represent a limited theory, high life satisfaction, and higher frequency of positive mood states. Correlations coefficients $r > |.11|$ are significant at $p < 05$.

Table 2

Descriptive Statistics and Zero-Order Correlations for the Main Variables of Study 2

Variable	*M (SD)*	1	2	3	4	5	6	7	8	9	10	11	12	13	14
T_1															
1. Willpower Theories	3.46 (0.51)														
2. Trait Self-Control	3.21 (0.57)	-.40													
3. Theories about Intelligence	3.28 (1.19)	.10	-.33												
4. Subjective Well-Being	3.77 (0.86)	-.26	.26	-.15											
5. Mood Pleasant vs. Unpleasant	3.68 (0.71)	-.18	.19	-.10	.77										
6. Mood Awake vs. Tired	2.98 (0.71)	-.23	.21	-.13	.72	.65									
7. Mood Calm vs. Stressed	3.37 (0.69)	-.17	.11	-.10	.60	.57	.60								
8. Mood Combined	3.34 (0.60)	-.23	.20	-.13	.81	.86	.87	.84							
T_2															
9. Willpower Theories	3.38 (0.59)	.61	-.34	.09	-.18	-.13	-.25	-.20	-.23						
10. Trait Self-Control	3.25 (0.61)	-.34	.72	-.30	.19	.13	.22	.10	.18	-.40					
11. Subjective Well-Being	3.60 (0.97)	-.23	.06	-.18	.39	.29	.37	.24	.35	-.29	.21				
12. Mood Pleasant vs. Unpleasant	3.66 (0.72)	-.20	.09	-.19	.38	.42	.40	.41	.48	-.27	.23	.71			
13. Mood Awake vs. Tired	2.92 (0.72)	-.26	.02	-.19	.39	.32	.47	.33	.44	-.28	.24	.75	.62		
14. Mood Calm vs. Stressed	3.05 (0.84)	-.16	.06	-.16	.30	.28	.38	.47	.44	-.32	.16	.66	.68	.60	
15. Mood Combined	3.21 (0.66)	-.23	.07	-.21	.41	.38	.48	.47	.52	-.34	.24	.81	.88	.84	.89

Note. High values in willpower theories reflect higher agreement with a limited theory, higher trait self-control, higher well-being, and higher frequency of positive mood states. At T_1 correlations coefficients $r > |.15|$ are significant at $p < .05$ (two-tailed). At T_2, correlations coefficients $r > |.16|$ are significant at $p < .05$ (two-tailed).

Table 3

Linear Hierarchical Regression Analyses Predicting Different Measures of Well-Being in the Final Exam Period (T_2)

				Affective Well-Being											
	Subjective Well-Being			Pleasant vs. Unpleasant			Awake vs. Tired			Calm vs. Stressed			Combined Mood Measure		
Predictor	ΔR^2	β	*p*	ΔR^2	β	*p*	ΔR^2	β	*p*	ΔR^2	β	*p*	ΔR^2	β	*p*
Step 1	.17			.20			.27			.24			.30		
Well-Being T_1		.39	<.001		.41	<.001		.48	<.001		.47	<.001		.52	<.001
Trait Self-Control		-.10	.220		-.04	.864		-.15	.048		-.03	.729		-.09	.196
Intelligence Theory		-.15	.061		-.16	.039		-.18	.016		-.13	.088		-.17	.019
Step 2	.21			.23			.31			.25			.33		
Well-Being T_1		.37	<.001		.40	<.001		.45	<.001		.46	<.001		.50	<.001
Trait Self-Control		-.18	.037		-.12	.165		-.24	.002		-.08	.353		-.17	.027
Intelligence Theory		-.15	.056		-.16	.037		-.18	.012		-.13	.086		-.17	.016
Willpower Theory		-.20	.014		-.18	.025		-.24	.002		-.12	.122		-.19	.009
$f^2_{\text{Willpower Theory}}$	.05			.04			.06			.01			.04		

Table 4

Descriptive Statistics and Zero-Order Correlations for the Main Variables of Study 3

Variable	*M*	*(SD)*	1	2	3	4	5	6	7	8	9	10	11	12
Baseline Survey														
1. Willpower Theories	3.34	(0.47)												
2. Optimism	3.68	(0.75)	-.15											
3. Pessimism	2.30	(0.73)	.11	-.40										
4. Self-efficacy	2.87	(0.38)	-.23	.36	-.25									
5. Life Satisfaction	5.24	(1.01)	-.13	.51	-.51	.38								
6. Affective Well-Being	3.41	(0.55)	-.18	.47	-.36	.40	.45							
7. Goal Progress	3.43	(0.74)	-.17	.24	-.12	.32	.30	.29						
Daily Diary Phase														
8. Subjective Well-Being	0.94	(0.00)	-.18	.40	-.35	.43	.42	.54	.20		-.44	.23		
9. Demands	1.04	(0.00)	.10	-.01	.13	-.03	-.03	-.16	.05	-.40		.08		
10. Effective Goal Striving	-0.02	(0.45)	-.21	.28	-.10	.30	.29	.25	.24	.38	.08			
Follow up Survey														
11. Life Satisfaction	5.21	(1.04)	-.11	.41	-.42	.31	.76	.38	.22	.37	-.08	.33		
12. Affective Well-Being	3.23	(0.63)	-.12	.32	-.35	.17	.27	.61	.09	.54	-.31	.20	.35	
13. Goal Progress	3.62	(0.66)	-.23	.05	-.12	.08	.20	.09	.35	.11	-.05	.36	.26	.14

Note. Correlations below diagonal are person-level correlations (N_{base} = 157/$N_{follow\text{-}up}$=138) with correlation coefficients being significant at $p < .05$ (two-tailed) when [a] $r >|.16|$ and [b] $r > |.17|$. Correlations above diagonal are day-level correlations (N = 1570) with correlations $r > |.05|$, $p < .05$.

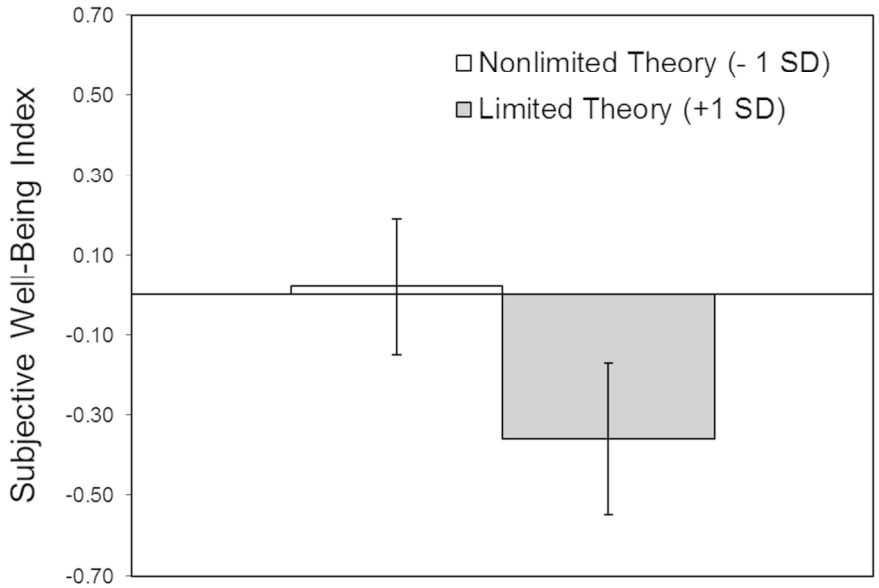

Figure 1. Results of a hierarchical regression model predicting subjective well-being at the end of the term by willpower theories, controlling for beginning-of-term well-being and trait self-control (Study 2). Error bars represent +/-1 SE.
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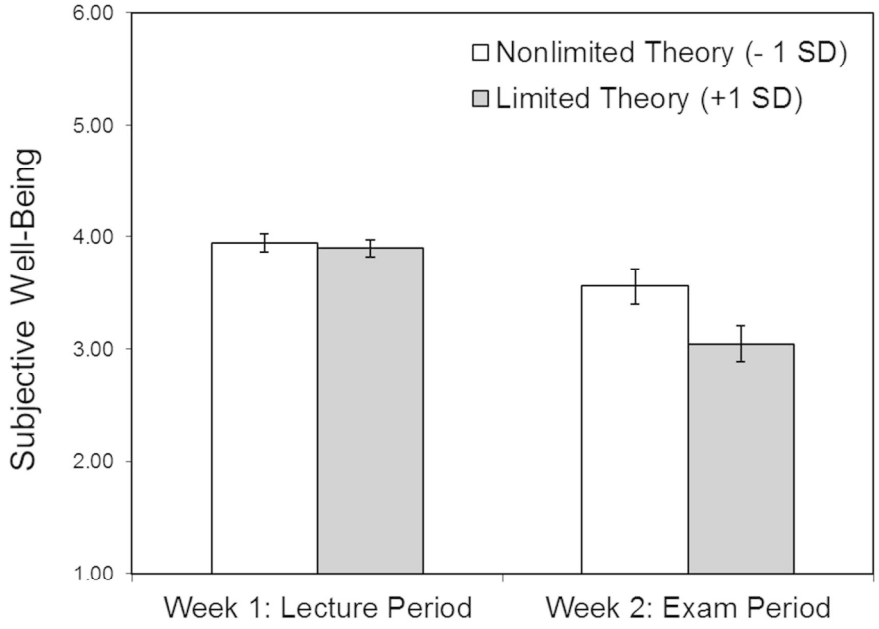

Figure 2. Result of a random-intercept model predicting levels of subjective well-being by phase of term and willpower theories (Study 3). Error bars represent +/-1 SE.
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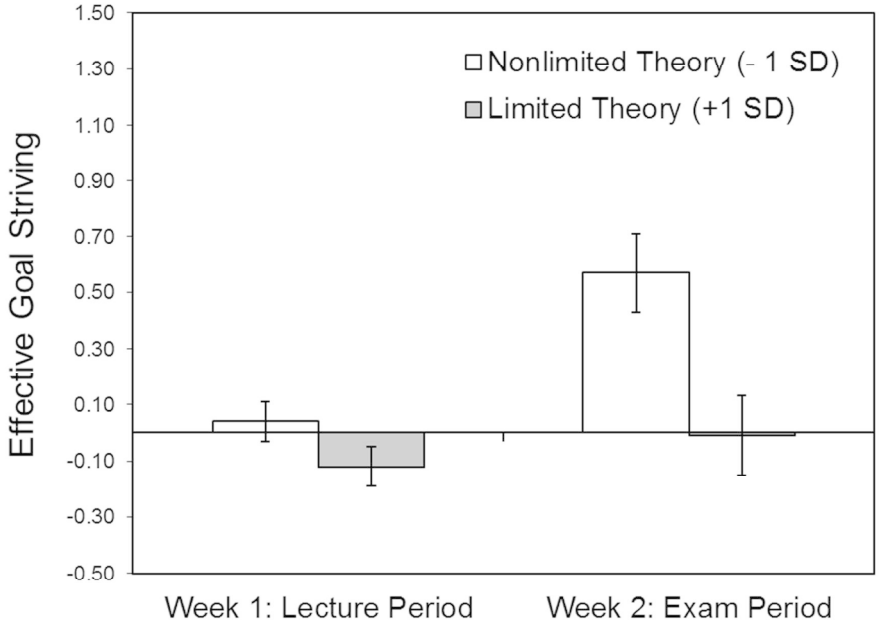

Figure 3. Result of a random-intercept model predicting effective goal striving by phase of term and willpower theories (Study 3). Error bars represent +/-1 SE.
166x119mm (300 x 300 DPI)